Annual Report 2025

International Alliance for Phytobiomes Research

www.phytobiomesalliance.org

Opening Letter

By Dusti Gallagher
Phytobiomes Alliance Executive Director

Welcome to the Phytobiomes Alliance 2025 Annual Report.

In 2025, the Alliance continued to advance the scientific and technological foundation for phytobiome-based sustainable agriculture by bringing together interdisciplinary expertise to translate research into practical, real-world solutions.

Our five Working Groups played a central role in this progress, identifying key research gaps and priorities across their focus areas. These insights are already shaping the Alliance's scientific direction and informing new collaborative efforts. Several groups also moved from planning to action, organizing webinars, contributing to conference programs, and developing perspective articles and white papers.

Across our global project portfolio, the Alliance contributed to meaningful advances in phytobiome science and application. In Australia, early results demonstrate that microbiome-based products can increase tomato biomass while reducing nematode pressure — an encouraging step toward new agricultural tools. The U.S. Culture Collection Network expanded engagement in its registry of living microbial collections, strengthening infrastructure for discovery and collaboration. In Europe and the UK, the Alliance supported projects focused on climate mitigation, microbiome biobanking and data integration, and the preservation and characterization of crop-associated microbiota. Together, these efforts continue to deepen our understanding of phytobiome systems while strengthening international collaboration.

Throughout the year, our workshops and webinars kept the community engaged and the momentum strong. Two workshops at the Plant and Animal Genome Conference and six webinars — covering topics from microbial biostimulants to ruminant microbiomes — attracted more than 1,500 registrants from 83 countries, underscoring the global reach and relevance of this work.

We were also pleased to welcome three new sponsors this year: Abrinca Genomics, Texas Tech University, and Switch Bioworks. I extend my sincere thanks to them — and to all our sponsors — for their continued support. The diversity of organizations across the Alliance is not only a strength but a necessity for advancing this field.

Looking ahead, I invite you to join us 3–5 November 2026 in Niagara-on-the-Lake, Ontario, Canada, for the International Phytobiomes Conference. This gathering reflects the core of our mission: bringing together scientists across disciplines and sectors to exchange ideas, build connections, and catalyze innovation. I hope to see you there.

About the Phytobiomes Alliance

The Phytobiomes Alliance is an international, nonprofit alliance of industry, academic, and governmental scientists that facilitates and coordinates international efforts toward expanding phytobiomes research.

The Alliance is a 501(c)(3) nonprofit organization registered in the United States.

Vision

By 2050, all farmers have the ability to use predictive and prescriptive analytics based on geophysical and biological conditions for determining the best combination of plants, management practices, and inputs for a specific site in a given year.

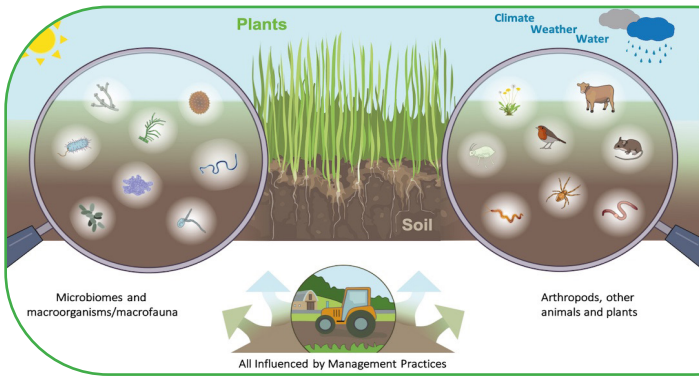
Mission

Establish a science and technology foundation for site-specific, phytobiome-based enhancement of sustainable food, feed, and fiber production.

The Phytobiomes Concept

Plants grow in association and interaction with complex communities of organisms, environmental conditions, and management practices. The term "Phytobiome" encompasses all of this complexity.

A phytobiome is the system comprising a plant, all associated organisms (microbes, insects, animals, other plants), and the environment (soil, air, water, climate).



Management practices influence phytobiomes and their health and productivity.

Examples of phytobiomes include agricultural systems (such as crop fields and orchards), natural ecosystems (such as forests and grasslands), and controlled environments (such as greenhouses).

Board of Directors

The Board of Directors sets the overall vision and mission of the Alliance and provides general oversight for the Alliance operations.

Kellye Eversole
Chair of the Board

Dusti Gallagher
Executive Director

Gwyn Beattie
Iowa State University, US

Natalie Breakfield
Newleaf Symbiotics, US

Trevor Charles
Waterloo University, CA

Magalie Guilhabert
Invaio Sciences, US

Jan Leach
Colorado State University, US

Emmanuelle Maguin
INRAE, FR

Matthew Ryan
CAB International, UK

Coordinating Committee

The Scientific Coordinating Committee establishes Alliance priorities; identifies research, resource, and technology gaps; develops strategies to fill these gaps; and creates working groups to lead efforts focused on specific topics.

The Coordinating Committee consists of representatives of financial sponsors, project leaders, and topical leaders. At the end of 2025, the Alliance Coordinating Committee comprised 39 members from 7 countries, representing 34 public and private entities.

Working Groups

Working Groups are the implementation arm of the Alliance. They lead efforts and develop priorities on specific topics, disciplines, and technologies. The Alliance currently has five active working groups. In 2025, all groups worked on identifying the top three research priorities that need to be addressed within their topic area.

Participation in Alliance working groups is open to Alliance sponsors, affiliates, and academic leaders of Alliance supported or led scientific projects.

Animal Microbiomes

Focus

Understanding the interconnections between people, animals, plants, and their shared environments, framed in a One Health perspective.

Research Priorities

1. Characterize the biodiversity and understand the inter-connectedness of plants, animals, soil, microbiomes and their environment in a One Health perspective
2. Harness microbiomes to optimize sustainability of animal production (methane emission, waste materials from animals, feed efficiency, carbon sequestration, etc.)
3. Determine the impact of microbiomes on animal resilience and health in the context of reducing the use of antibiotics

2025 Activities

- Organized a webinar series (9 April and 8 October) to showcase the diversity of current research addressing the identified gaps
- Presented oral and poster presentations at international conferences (Society of Animal Genetics Conference; European Association for Animal Production Meeting)
- Began drafting a perspective article on microbial transfer between soil, plants, and animals

Controlled Environment Agriculture

Focus

Identifying key challenges in controlled environment agriculture (CEA) that can be addressed through Phytobiomes research.

Research Priorities

1. Improve disease prevention and system stability through real-time monitoring of microbiomes and pathogens in water and air
2. Identify the most effective microbial inoculants and nutrient supplementation strategies to promote a stable and beneficial microbiome in CEA systems
3. Identify the most effective sanitation methods to effectively control pathogens while preserving beneficial microbial communities in CEA systems

2025 Activities

- Explored the creation of a NSF Research Coordination Network, including identifying potential participants
- Began working on a perspective article outlining the current state of phytobiomes knowledge within CEA

Working Groups (Continued)

Microbiomes

Focus

Identifying research gaps in plant microbiome research that will translate into societal benefits.

Research Priorities

1. Understand microbial persistence processes
2. Understand community interactions and functionalities (within and between communities)
3. Develop the capacity to make meaningful predictions to enable farmers to make informed decisions based on current knowledge

2025 Activities

- Organized the first webinar (25 October) in a series to highlight current research addressing the identified gaps, with a focus on engaging early career scientists
- Explored potential topics for a second perspective article (first article was published in 2024 https://doi.org/10.1094/PHYTO-02-24-0054-KC)

Regulatory

Focus

Facilitating a more rapid and effective risk assessment of microbial products.

Research Priorities

1. Understand microbial persistence in the environment
2. Promote clear regulatory guidelines for monitoring microbes introduced into the environment
3. Optimize microbial classification approaches
4. Promote regulatory guidelines on the presence & prevalence standard for microbes in the environment
5. Promote regulatory efficiency & uniformity, e.g. having a clear definition of "biocontrol" to reduce burden on microbes with no true biocontrol effect

2025 Activities

- Started working on a white paper/perspective article outlining a science-based, data-driven framework for microbial regulations, planned for completion in 2026

Soil Health

2025 Activities

The Working Group was formed at the end of 2024 and focused its 2025 activities on defining research priorities, with initial discussions centered on soil microbiome data integration, mechanistic links between soil biology and crop productivity, and translation of findings into soil-improving products.

Projects & Activities

The Alliance initiates, participates in, and supports collaborative research projects and activities to address the priorities identified by the Working Groups and Scientific Coordinating Committee to build a foundation of systems-level knowledge of phytobiomes.

Collaborative Research Projects

Novel Microbiome Technologies to Increase Profitability for Australian Horticulture

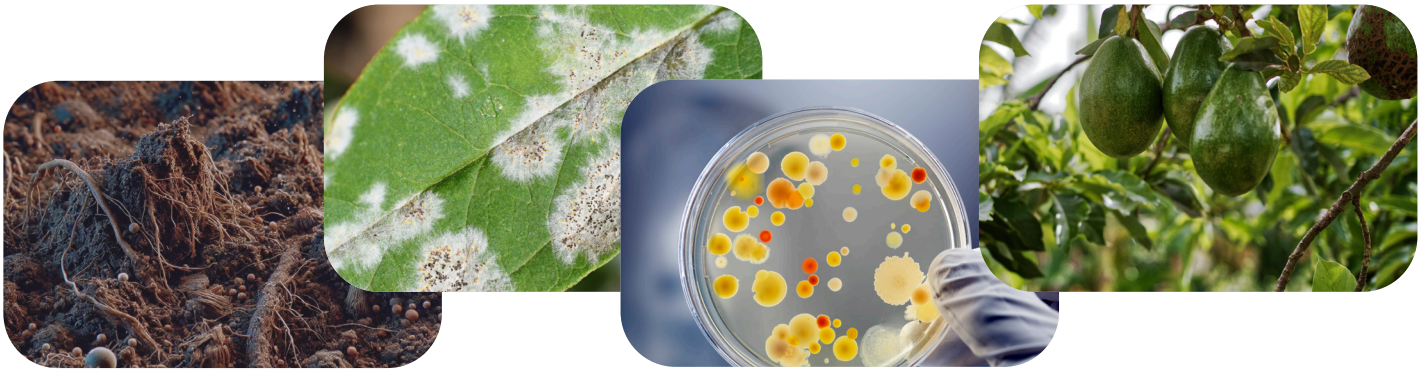
(Funded by Hort Innovation, Australia)

This project, led by Kirsty Bayliss at Murdoch University, investigates crop-associated microbiomes to improve the productivity and profitability of Australian horticulture. The field-based study focuses on tomatoes, potatoes, and avocados, and uses metabarcoding and metagenomics to analyze whole microbiomes and identify beneficial microbes that could be developed into new agricultural products.

Early results show that product application can increase tomato biomass and reduce nematode symptoms in tomatoes grown in soil preconditioned with the products. Avocado trial results suggest that products increase the abundance of certain microbes, and the potato trial has identified microbes that are inherited from one generation to the next.

The next step is to determine whether links between crop performance and the microbiome can guide the selection of beneficial microorganisms for future product development.

The project, which began in March 2022, has been extended through December 2026. In 2025, the team published results in the Canadian Journal of Plant Pathology (Obiazikwor, O. H., Shah, A., Hardy, G. E. St. J., & Bayliss, K., (2025) *The rhizosphere microbiome can sustainably protect field-grown tomato crops against soil-borne pathogens and plant parasitic nematodes* https://doi.org/10.1080/07060661.2025.2477644) and presented preliminary findings during a Phytobiomes Alliance webinar in October.



Projects & Activities (Continued)

United States Culture Collection Network

(Funded by the U.S. National Science Foundation)

usccn.org

Launched in April 2022, the USCCN connects scientists and institutions that maintain living microbial culture collections. Coordinated by the Phytobiomes Alliance, the five-year project aims to facilitate the safe and responsible use of microbial resources for research, education, industry, medicine, and agriculture.

During its fourth year in 2025, USCCN focused on expanding awareness and participation in the USCCN Registry of Living Microbial Culture Collections, its online searchable directory of microbial collections, with an emphasis on outreach and community engagement.

The project exhibited and presented a poster at ASM Microbe 2025 (July 19–22, Los Angeles, CA), where booth staff engaged with more than 100 attendees per day, representing microbial collections ranging from large institutional repositories to smaller lab-based collections, and also presented a poster at the IS-MPMI Congress (July 13–17, Cologne, Germany).

Additionally, the network organized a webinar in June 2025, presented by Victoria Knight-Connoni (Head of Content and Product Development, ATCC), which highlighted the diversity and importance of the ATCC collection and its tools for authenticating materials. The project also continuously engaged with the microbial culture collection community via blog posts, mailing list messages, and social media posts. Planning also began for a USCCN conference to be held July 31–August 1, 2026. The project continued its involvement with the Microbes-4-Climate project and supported the submission of a collaborative proposal with MIRRI-ERIC.

Microbes-4-Climate: Microbial services addressing climate change risks for biodiversity, agricultural and forestry ecosystems

(Funded by the European Union)

microbes4climate.eu

The Alliance is one of 31 partners from 13 countries engaged in the Microbes-4-Climate (M4C) project, which aims to unravel the complexity of microbe–soil–plant–environment interactions and understand how these systems can mitigate the adverse effects of climate change. The Alliance's role in the project is to provide advice and guidance on accessing US microbial resources and cooperating entities.

In its first year, the M4C project launched key resources and activities, including a catalogue of services, data platforms supporting FAIR principles, and a collaborative working environment for researchers. It also opened its first Transnational Access (TNA) call (March–June 2025) offering fully funded access to cutting-edge research infrastructures across Europe. Scientific work focused on a new bioinformatics pipeline for single-cell genomics, synthetic microbial communities and TNA access programming. Governance structures were established, alongside outreach materials, social media channels, and a policy brief.

Projects & Activities (Continued)

UK Cryobank
(Funded by BBSRC – UK Research and Innovation)
agmicrobiomebase.org

The UK Crop Microbiome Cryobank (UK CMCB) project integrates genomic and metagenomic data with a cryobank collection of soil and rhizosphere microbiome samples from six major UK crops: wheat, spring barley, spring oats, oilseed rape, fava bean, and sugar beet.

The microbiome samples span nine UK agricultural soil types and include living microbial material (consortia and isolates), DNA sequences, and associated metadata, accessible through the open-access AgMicrobiomeBase catalogue, which links to the European Nucleotide Archive and MGnify.

The five-year project concluded in September 2025.

Participation in International Networks

The Alliance is participating in various Task Forces and Initiatives in the EU, the UK, and the US.

- The Alliance Executive Director, Dusti Gallagher, is a member of the scientific Advisory Board of the EU project MICRObiome Biobanking (RI) Enabler: MICROBE, which aims to develop methods and technologies for biobanking of microbiome samples.
  In April 2025, Gallagher attended the annual project meeting in Wöltingerode, Germany, where partners presented project progress, shared four microbiome use cases (soil, marine, seed, and human) and visited the internationally renowned Leibniz Institute DSMZ – German Collection of Microorganisms and Cell Cultures GmbH.
- The Alliance Scientific Advisor, Kellye Eversole, is a member of the scientific advisory board of the World Bioprotection Forum, a UK-based, international, non-profit organization focused on improving regulatory frameworks for microbial products and encouraging collaboration between the biocontrol industry and academia in the AgriTech sector.
- The Alliance is participating in the US-based AgBioData research coordination network which is focused on bringing together the international community to enhance genomics, genetics, and breeding research outcomes through standardization of practices and protocols across agricultural databases.
- The Alliance is a member of IMMSA (International Microbiome and Multi-Omics Standards Alliance), a consortium that focuses on coordinating cross-cutting efforts that address microbiome measurement challenges of all major microbiological ecosystems.

Events

The Alliance organizes webinars, workshops, and a biennial conference to showcase the latest research advances and connect experts across disciplines in phytobiomes science.

Workshops

In 2025, the Alliance organized **two workshops** during the Plant and Animal Genome Conference (San Diego, CA, USA) in January: "*Exploring Phytobiomes*" and "*The Uniqueness and Commonalities Between Plant, Animal and Soil Microbiomes*".

These workshops featured presentations showcasing the latest trends and research results in phytobiomes science, exemplifying the diversity of studies conducted in the field, from plant disease resistance and microbial biofertilizers to coral-algal symbiosis, host genetics and microbiome dynamics across plant, animal, and soil systems.

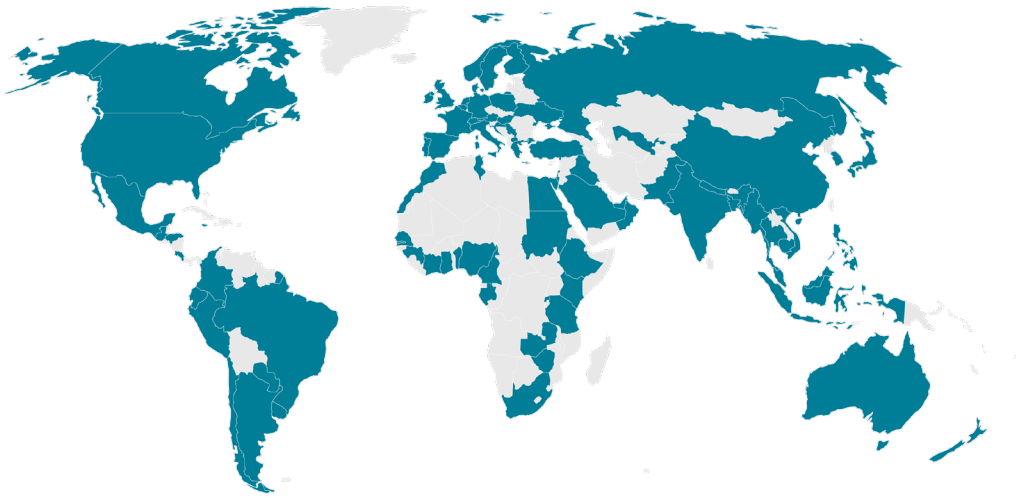
Webinars

In 2025, the alliance organized **six webinars** on topics including microbial biostimulants for agriculture, host genetics and livestock gut microbiomes, biosensor design for ecosystem engineering, microbiome-dependent crop traits, ruminant microbiomes for sustainable agriculture, and the diversity of biological collections.

Three of these webinars were organized by the Alliance's Working Groups – two by the Animal Microbiomes Working Group and one by the Microbiomes Working Group – demonstrating their active role in driving research discussions and sharing progress on priorities and recent results within their focus areas.

Recordings of all webinars are available on the Alliance YouTube channel, which has 595 subscribers and received 3,000 views in 2025. The channel's library of 44 webinars has received more than 13,100 views to date.

1563	**Registrations**
83	**Countries**
70%	**Academia**
18%	**Industry**
12%	**Government Agencies**

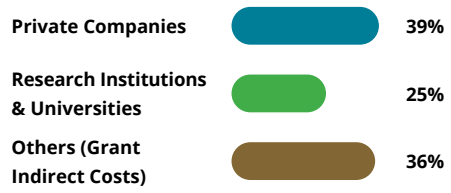


Webinar registrations

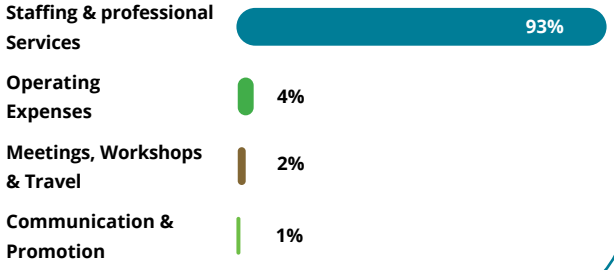
Finances

The Alliance is financially supported by sponsors – private companies, universities and research institutions – that share its vision and contribute to establishing its priorities and strategies through the Coordinating Committee.

Sources of funding



Expenses



SAVE THE DATE

INTERNATIONAL PHYTOBIOMES CONFERENCE 2026

INTERNATIONAL PHYTOBIOMES CONFERENCE

3–5 November 2026

Niagara-on-the-Lake, Ontario, Canada

Cultivating Phytobiomes: From Systems Science to Agricultural Innovation

www.phytobiomesconference.org

2025 Sponsors

Interested in sponsoring the Alliance? Contact us!
The Alliance is looking forward to welcoming new sponsors to help identify priorities, drive scientific progress, and deliver real-world impact for the future of agriculture and society.

Get in Touch with Us!

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